PATENT COOPERATION TREAT.

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner US Department of Commerce United States Patent and Trademark Office, PCT 2011 South Clark Place Room CP2/5C24 Arlington, VA 22202 **ETATS-UNIS D'AMERIQUE**

in its capacity as elected Office

Date of mailing (day/month/year) 27 February 2001 (27.02.01)

International application No. PCT/EP00/05275

International filing date (day/month/year)

07 June 2000 (07.06.00)

Applicant's or agent's file reference PCT 1182-009

Priority date (day/month/year) 01 July 1999 (01.07.99)

Applicant

MIKKELSEN, Svend-Erik et al

	The designated Office is hereby notified of its election made: X in the demand filed with the International Preliminary Examining Authority on:
	12 January 2001 (12.01.01)
	in a notice effecting later election filed with the International Bureau on:
2.	The election X was was not
	made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland

Authorized officer

Pascal Piriou

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

(19) World Intellectual Property Organization International Bureau





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(10) International Publication Number WO 01/02515 A1

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(21) International Application Number: PCT/EP00/05275

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English

C10L 1/02

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English

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1 July 1999 (01.07.1999)

- (71) Applicant (for all designated States except US): HAL-DOR TOPSOE A/S [DK/DK]; Nymøllevej 55, DK-2800 Lyngby (DK).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): MIKKELSEN, Svend-Erik [DK/DK]; Christianshøjvej 20, Kirke Vaerløse, DK-3500 Vaerløse (DK). LEHRMANN, Peter [DK/DK]; Hovedgaden 47D, 2.tv., DK-3460 Birkerød (DK). BØGILD HANSEN, John [DK/DK]; Villemoesgade 39, 2.tv., DK-2100 Copenhagen Ø (DK).

- (74) Agent: GRÜNECKER, KINKELDEY, STOCKMAIR & SCHWANHÄUSSER; Maximilianstrasse 58, 80538 München (DE).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO. NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

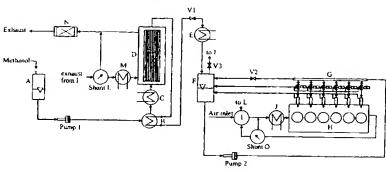
Published:

With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CONTINUOUS DEHYDRATION OF ALCOHOL TO ETHER AND WATER USED AS FUEL FOR DIESEL EN-**GINES**

fied Flow Sheet for Methanol to DMF Fuer Processing Unit for Mobil or Stationary Diesel Engine



(57) Abstract: The present invention relates to an oxygenated fuel composition suitable for use in compression ignition internal combustion engines, equipped with inlet air heater, a catalytic alcohol dehydration equipment suitable for chemical equilibrium conversion of methanol and higher alcohol to their associated ether plus water. The generated fuels contain a synergetic combination of unconverted alcohol like methanol and ethanol and associated generated ether as dimethylether and diethylether and water. The generated fuel is injected as a liquid directly into the cylinders of the engine. The generated ether provides good ignition properties. The unconverted alcohol provides a stable single-phase fuel and the water results in a reduction in combustion temperature yielding very low concentration of nitrogen oxides in the exhaust gas. Another advantage associated with the obtained fuel compositions is very low formation of particulate matter. Experimental investigations have shown that high overall engine efficiency is obtained. The generated fuel compositions are used as main fuel for start and operation of the engine. Further the invention reduces the dependency of fossil liquid fuel as the alcohol feed used can be produced from natural gas and basically all carbon bearing substances like coal and renewable sources like wood.

Internati 'Application No PCT/EY 00/05275

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 C10L1/02 According to International Patent Classification (IPC) or to both national classification and IPC **B. FIELDS SEARCHED** Minimum documentation searched (classification system followed by classification symbols) IPC 7 C10L F02B Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, PAJ, WPI Data C. DOCUMENTS CONSIDERED TO BE RELEVANT Category 9 Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. Χ EP 0 431 357 A (GUNNERMAN RUDOLF W) 1 12 June 1991 (1991-06-12) Υ claims 1,3,6,11,15 1,2,6 Y US 4 422 412 A (NORTON JOHN H R) 1,2,6 27 December 1983 (1983-12-27) claims 1,2 column 3, line 40 - line 45 Α GB 1 593 852 A (BURMAH OIL TRADING LTD) 1.6 22 July 1981 (1981-07-22) claims 1-3 US 5 906 664 A (MIKKELSEN SVEND-ERIK ET Α AL) 25 May 1999 (1999-05-25) cited in the application Further documents are listed in the continuation of box C. Patent family members are listed in annex. Special categories of cited documents. T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the "A" document defining the general state of the lart which is not considered to be of particular relevance. invention "E" earlier document but published on or after the international "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention citation or other special reason (as specified) cannot be considered to involve an inventive step when the document is combined with one or more other such docu-"O" document referring to an oral disclosure, use, exhibition or other means ments, such combination being obvious to a person skilled document published prior to the international filling date but later than the priority date claimed "&" document member of the same patent family Date of the actual completion of the international search Date of mailing of the international search report 20 October 2000 27/10/2000 Name and mailing address of the ISA Authorized officer European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx: 31 651 epo nl, De Herdt, O Fax: (+31-70) 340-3016

INTERNATION SEARCH REPORT

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Internation Application No
PCT/EP 00/05275

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Form PCT/ISA/210 (patent family annex) (July 1992)

PATENT COOPERATION TREATY REC'D 2 0 1'CY 2001

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REC'D 2 0 1'07 2001

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

PCT 1	t's or agent's file reference		Notification of Transmittal of International minary Examination Report (Form PCT/IPEA/416)
	onal application No.	International filing date (day/month/year)	
	P00/05275	07/06/2000	Priority date (day/month/year) 01/07/1999
C10L1/		r national classification and IPC	
1. This	international preliminary ex is transmitted to the applica	amination report has been prepared by this	s International Preliminary Examining Authorit
2. This	REPORT consists of a total	of 4 sheets, including this cover sheet.	
	been amended and are the	nied by ANNEXES, i.e. sheets of the descr basis for this report and/or sheets containing a 607 of the Administrative Instructions und	ription, claims and/or drawings which have ng rectifications made before this Authority der the PCT).
The	se annexes consist of a total	of 1 sheets.	
3. This	report contains indications r	elating to the following items:	
3. This	e.	elating to the following items:	
	☐ Basis of the report	elating to the following items:	
ı	☑ Basis of the report☐ Priority		step and industrial applicability
11	☑ Basis of the report☐ Priority	f opinion with regard to novelty, inventive s	step and industrial applicability
1 11 111	 ☑ Basis of the report ☐ Priority ☐ Non-establishment o ☐ Lack of unity of inver ☒ Reasoned statement 	f opinion with regard to novelty, inventive s ntion under Article 35(2) with regard to novelty.	•
 V	 ☑ Basis of the report ☐ Priority ☐ Non-establishment o ☐ Lack of unity of inver ☒ Reasoned statement 	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, utions suporting such statement	•
 V V	 ☑ Basis of the report ☑ Priority ☑ Non-establishment o ☑ Lack of unity of inver ☒ Reasoned statement citations and explana ☑ Certain documents of 	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, utions suporting such statement	•
	 ☑ Basis of the report ☐ Priority ☐ Non-establishment o ☐ Lack of unity of inver ☒ Reasoned statement citations and explana ☐ Certain documents o ☐ Certain defects in the 	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, ations suporting such statement exited	•
	 ☑ Basis of the report ☐ Priority ☐ Non-establishment o ☐ Lack of unity of inver ☒ Reasoned statement citations and explana ☐ Certain documents o ☐ Certain defects in the 	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, ations suporting such statement solutions international application	inventive step or industrial applicability;
I III IV VI VII VIII	Basis of the report Priority Non-establishment o Lack of unity of inver Reasoned statement citations and explana Certain documents o Certain defects in the Certain observations	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, ations suporting such statement sited international application on the international application	inventive step or industrial applicability;
IIIIIVVVIIIIVIIII	Basis of the report Priority Non-establishment o Lack of unity of inver Reasoned statement citations and explana Certain documents o Certain defects in the Certain observations comission of the demand	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, stions suporting such statement sited einternational application on the international application Date of completio	inventive step or industrial applicability;
IIIIIVVVIIIIVIIII	Basis of the report Priority Non-establishment o Lack of unity of inver Reasoned statement citations and explana Certain documents o Certain defects in the Certain observations omission of the demand	f opinion with regard to novelty, inventive solution under Article 35(2) with regard to novelty, ations suporting such statement soluted a international application on the international application Date of completion 16.11.2001 Authorized officer	inventive step or industrial applicability;

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05275

I. Basis of the report

1.	the and	receiving Office in	response to an invitation unde to this report since they do not to	r Article 14 are	referred to in this i	report as "originally filed"
	1-2	3	as originally filed			
	Cla	ims, No.:				
	1-5		as received on	21/05/2001	with letter of	18/05/2001
	Dra	wings, sheets:				
	1/2	,2/2	as originally filed			
2.	Wit lang	h regard to the lang guage in which the i	juage, all the elements marked international application was fil	d above were a ed, unless othe	vailable or furnishe erwise indicated un	ed to this Authority in the oder this item.
	The	ese elements were a	available or furnished to this Au	ithority in the fo	ollowing language:	, which is:
		the language of a t	translation furnished for the pu	rposes of the i	nternational search	(under Rule 23.1(b)).
			blication of the international ap			` '/
		the language of a t 55.2 and/or 55.3).	translation furnished for the pu	rposes of inter	national preliminary	examination (under Rule
3.	With inte	n regard to any nuc rnational preliminan	leotide and/or amino acid se y examination was carried out	quence disclos on the basis of	sed in the internation the sequence listing	onal application, the ng:
		contained in the int	ternational application in writter	n form.		
		filed together with t	the international application in	computer read	able form.	
		furnished subseque	ently to this Authority in written	form.		
		furnished subseque	ently to this Authority in compu	iter readable fo	orm.	
			the subsequently furnished wo oplication as filed has been furn		e listing does not go	o beyond the disclosure in
		The statement that listing has been fur	the information recorded in conished.	mputer readab	ole form is identical	to the written sequence
4.	The	amendments have	resulted in the cancellation of:			
		the description,	pages:			
		the claims,	Nos.:			

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05275

de, since they have beer
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m 1 and annexed to this
dustrial applicability;

2. Citations and explanations see separate sheet

SECTION V (NOVELTY AND INVENTIVE STEP)

- 1. The claimed subject-matter does not meet the requirements of Article 33(3) PCT in view of D1 and D2 constitute the closest prior art documents.
- 1.1 D1=US-A-5 906 664 discloses the use of the DME, methanol and water combinations disclosed at claims 1 to 5 and examples 1 to 4 (see table 1) in an engine having a air-to-air intercooler for the turbocharger (see example 4, in particular col. 7, lines 39-43). It is well known that the normally working intercoolers cool the air entering into the cylinder from 600°C obtained after compression down to approximately 120°C.
- 1.2 D2=US-A-4 422 412 discloses a process for the dehydration of methanol to DME at temperatures ranging from 80 to 400°C (preferably from 250° to 350°C).

The claimed subject-matter meets the requirements of Article 33(2) PCT in view of each of D1 and D2 since at least the pressure for the process for obtaining DME disclosed in D2 is not explicitly cited (see in particular D2, col. 3, lines 3-10 wherein all the rest of the operational conditions are cited).

2. Nevertheless the pressures at present in the wording of claim 1 are quite common operational conditions which could be used by the skilled person without involving any inventive step.

The absence of at least an objectively solved technical problem as a consequence of a differentiating technical feature present in the wording of the independent claim, the inventive step of the claimed subject-matter cannot be acknowledged.

In fact modifications which do not solve any technical problem can be considered as obvious for the skilled person and therefore not inventive according to Article 33(3) PCT. At present time nowhere in the application as filed it is disclosed that a technical problem can be solved by technical means been different from those well known for the skilled person defined in D1 and D2.



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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference		cation of Transmittal of International Search Report T/ISA/220) as well as, where applicable, item 5 below.
PCT 1182-009	ACTION	Trior verse, where approache, item o below.
International application No.	International filing date (day/month/ye	ear) (Earliest) Priority Date (day/month/year)
PCT/EP 00/05275	07/06/2000	01/07/1999
Applicant		
HALDOR TOPSOE A/S		
This International Search Report has bee according to Article 18. A copy is being tra		ing Authority and is transmitted to the applicant
This International Search Report consists X It is also accompanied by	of a total of2 sheets a copy of each prior art document cited	
Basis of the report		
	international search was carried out on ess otherwise indicated under this item	the basis of the international application in the
the international search w Authority (Rule 23.1(b)).	as carried out on the basis of a translat	tion of the international application furnished to this
b. With regard to any nucleotide an was carried out on the basis of the		n the international application, the international search
	onal application in written form.	
filed together with the inte	rnational application in computer reada	ble form.
	this Authority in written form.	
	this Authority in computer readble form	
	s filed has been furnished.	isting does not go beyond the disclosure in the
the statement that the info furnished	ormation recorded in computer readable	e form is identical to the written sequence listing has been
2. Certain claims were fou	nd unsearchable (See Box I).	
3. Unity of Invention is lac	ki ng (see Box II).	
4. With regard to the title,		
X the text is approved as su	bmitted by the applicant.	
the text has been establis	hed by this Authority to read as follows:	
5. With regard to the abstract,		
	hed, according to Rule 38.2(b), by this	Authority as it appears in Box III. The applicant may, arch report, submit comments to this Authority.
6. The figure of the drawings to be publ	ished with the abstract is Figure No.	2
as suggested by the appli	cant.	None of the figures.
because the applicant fail	ed to suggest a figure.	
X because this figure better	characterizes the invention.	

INTERMITIONAL SEARCH REPORT

onal Application No PCI/EP 00/05275

	C10L1/02		
	o International Patent Classification (IPC) or to both national cla	issitication and IPC	
Minimum do IPC 7	ocumentation searched (classification system followed by class C10L F02B	sification symbols)	
Documenta	tion searched other than minimum documentation to the extent	that such documents are included in the fields so	earched
	data base consulted during the international search (name of date ternal, PAJ, WPI Data	ata base and, where practical, search terms used	<u>, , , , , , , , , , , , , , , , , , , </u>
с посим	ENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of t	the relevant passages	Relevant to claim No.
-			
X	EP 0 431 357 A (GUNNERMAN RUDO)LF W)	1
Υ	12 June 1991 (1991-06-12) claims 1,3,6,11,15		1,2,6
Y	US 4 422 412 A (NORTON JOHN H 27 December 1983 (1983-12-27) claims 1,2 column 3, line 40 - line 45	R)	1,2,6
A	GB 1 593 852 A (BURMAH OIL TRA 22 July 1981 (1981-07-22) claims 1-3	ADING LTD)	1,6
А	US 5 906 664 A (MIKKELSEN SVEN AL) 25 May 1999 (1999-05-25) cited in the application	ND-ERIK ET	
Furti	her documents are listed in the continuation of box C.	Patent family members are listed	lin annex.
Ш	ategories of cited documents :		··
"A" docume consider if earlier of filing of "L" docume which citation other if "P" docume later if	ent defining the general state of the art which is not dered to be of particular relevance document but published on or after the international date ent which may throw doubts on priority claim(s) or is cited to establish the publication date of another in or other special reason (as specified) ent referring to an oral disclosure, use, exhibition or means ent published prior to the international filling date but han the priority date claimed	"T" later document published after the inte or priority date and not in conflict with cited to understand the principle or th invention "X" document of particular relevance; the cannot be considered novel or cannot involve an inventive step when the do "Y" document of particular relevance; the cannot be considered to involve an in document is combined with one or moments, such combined with one or moments, such combination being obvio in the art. "&" document member of the same patent	the application but learny underlying the claimed invention to be considered to occument is taken alone claimed invention iventive step when the ore other such documes to a person skilled
	actual completion of the international search	Date of mailing of the international sec	arch report
2	0 October 2000	27/10/2000	
Name and r	mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL = 2280 HV Rijswijk Tel. (+31=70) 340=2040, Tx. 31 651 epo nl, Fax: (+31=70) 340=3016	Authonzed officer De Herdt, 0	

INTERMITIONAL SEARCH REPORT

Information on patent family members

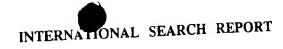
In Jonal Application No PCT/EP 00/05275

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INTERESTIONAL SEARCH REPORT Information on patent family members

In	ional	Application No	
PCT/	/EP	00/05275	

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 10504054	T 14-04-1998
		NO 970601 A	A 09-04-1997
		NZ 290675 A	19-12-1997
		RU 2141995 (27-11-1999
		WO 9605274 A	22-02-1996
		ZA 9506333 A	11-03-1996





Internati 'Application No PCT/Er 00/05275

		ories and IPC							
	temational Patent Classification (IPC) or to both national classific	cation and IPO							
FIELDS SE	ARCHED mentation searched (classification system followed by classification system)	tion symbols)	ļ						
PC 7	CIOL FOSB								
ocumentation	n searched other than minimum documentation to the extent that	such documents are included in the fields sea	rched						
ectronic data	a base consulted during the international search (name of data b	pase and, where practical, search terms used							
PO-Int	ernal, PAJ, WPI Data								
. DOCUME	NTS CONSIDERED TO BE RELEVANT Citation of document, with indication, where appropriate, of the	relevant passages	Relevant to claim No.						
ategory *	Citation of document, with indication								
X	· EP 0 431 357 A (GUNNERMAN RUDOL	FW)	1						
^	12 June 1991 (1991-06-12)		1,2,6						
Y	claims 1,3,6,11,15		1,2,6						
Υ	US 4 422 412 A (NORTON JOHN H R 27 December 1983 (1983-12-27)	()							
	l claims 1 2								
	column 3, line 40 - line 45		1,6						
Α	GB 1 593 852 A (BURMAH OIL TRAI	DING LTD)	1,0						
	22 July 1981 (1981-07-22) claims 1-3								
	US 5 906 664 A (MIKKELSEN SVEN	D-ERIK ET							
A	L ΔL) 25 May 1999 (1999-05-25)								
	cited in the application								
	and the star of heavily	Patent family members are liste	ed in annex.						
	inther documents are listed in the continuation of box C.								
	categories of cited documents :	"T" later document published after the in or priority date and not in conflict will cited to understand the principle or	theory underlying the						
	ment defining the general state of the lart which is not sidered to be of particular relevance	invention	a claimed invention						
filio	isidered to be on published on or after the international er document but published on or after the international ig date iment which may throw doubts on priority claim(s) or iment which may throw doubts on priority claim(s) or international to catalyish the publication date of another	cannot be considered hover or can	document is taken alone						
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.O. acc	ument referring to an oral disclosure, use, extitotion of	ments, such combination being or in the art.	Wiods to a post-						
"P" doci	ument published prior to the international fitting date but er than the priority date claimed	*&" document member of the same pat Date of mailing of the internationa							
Date of	the actual completion of the international search								
	20 October 2000	27/10/2000							
Name a	and pulling address of the ISA	Authorized officer							
	European Patent Office, P.B. 5818 Patentiaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Herdt, O							

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Internati Application No
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PATENT COOPERATION TREAT.

PCT

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

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Office, PCT
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CP2/5C24
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at the same	ETATS-UNIS D'AMERIQUE
Date of mailing (day/month/year)	in its capacity as elected Office
27 February 2001 (27.02.01)	Applicant's or agent's file reference
International application No.	PCT 1182-009
PCT/EP00/05275	Priority date (day/month/year)
International filing date (day/month/year)	01 July 1999 (01.07.99)
07 June 2000 (07.06.00)	0.02.,
Applicant	
MIKKELSEN, Svend-Erik et al	

1.	The designated Office is hereby notified of its election made: X in the demand filed with the International Preliminary Examining Authority on: 12 January 2001 (12.01.01) in a notice effecting later election filed with the International Bureau on:	
	2. The election X was was was not was not made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35

Authorized officer

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